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ABSTRACT

In this study, high and low socioeconomic status (SES) retarded children (approximately 10 years old) were matched on chronological age and two IQ measures. Children in each SES group were presented with a series of simple learning tasks derived from the work of Jensen and his hypotheses about two levels of learning. The tasks themselves were varied along several dimensions so as to present a continuum from simple to complex learning. Tasks included Paired Associates, Serial Learning, and Free Recall. Results indicated that low SES children outperformed the high SES group on simple, but not on complex, tasks although a continuum was not demonstrated. While partial confirmation of the Jensen hypothesis was offered by the results, further examination of the results suggested revision of the model and alternative directions for the classification and diagnosis of the retarded. (Author/WI)

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TWO TYPES OF COGNITIVE FUNCTIONING IN PRIMARY AND SECONDARY RETARDATION

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Abstract

High and low socioeconomic status (SES) retarded children were matched on chronological age and two IQ measures. Children in each SES group were presented with a series of simple learning tasks derived from the work of Jensen and his hypotheses about two levels of learning. The tasks themselves were varied along several dimensions so as to present a continuum from simple to complex learning. Low SES children outperformed the High SES group on simple, but not complex tasks, although a continuum was not demonstrated by the results. While the study offered partial confirmation for Jensen's hypotheses, further examination of the results suggested revision of the model and alternative directions for the classification and diagnosis of the retarded.

The general distinction made by Jensen (1970) between two levels of cognitive functioning and their hypothesized relationship with socioeconomic status (SES) has given rise to a large body of research involving a variety of learning tasks differing along the dimensions of associative vs. complex learning (Level I-Level II). However, the picture obtained from many of these studies is not always clear. Many variations in results have been found which seem to be a function of at least four factors: age of Ss; range of intelligence chosen; type of task; and form of task presentation. The different results with respect to the last two factors suggest that the two levels of cognitive functioning, rather than representing a dichotomy, are better conceived of as a continuum. The latter might vary on such dimensions as concrete vs. abstract representation; the amount of prior experience and skill required; the amount of information to be processed on any given exposure to the task; and the demands for structure and transformation.

Variations in results as a function of range of intelligence suggest that the hypotheses should be tested separately at different levels of intelligence, and with careful matching of I.Q. between high and low SES Ss at each of the levels chosen. To date, only in a few studies has the hypothesis been extended to include retarded children (Jensen, 1970). It appears to be a promising line of research in the attempt to develop objective methods for distinguishing between primary and secondary retardation.

By juxtaposing the notion of two types of retardation and the hypothesized relationship between two levels of learning and SES, one might then expect the following:

a) in a matched sample of retardates, practically all high SES Ss would be in the category of primary retardation, whereas a majority of low SES

Ss would be categorized as secondary retardates.

b) low SES retardates, as a consequence, would be superior to high SES retardates on associative learning tasks, while not differing on complex learning problems.

c) the relationship between measured intelligence and associative learning will be higher in the high SES group of retardates.

A recent study (Orn & Das, 1972) investigating the Jensen hypothesis with retarded Ss, and that did employ careful matching, lends partial support to the above conclusions. However, the tasks employed in their investigation were not those generally used in this type of study, and only minimally introduced any variations in the task. The present authors began several years ago to study learning abilities in disadvantaged and advantaged school children matched on several ranges of intelligence, and with systematic variation of learning tasks along the dimensions previously noted. The study reported on below is a part of the larger project and is concerned only with retarded children from high and low SES groups.

METHOD

Subjects

After an initial screening that included the gathering of socio-economic background data, fifteen children, average ten years of age, were selected from a population of children in institutions for the retarded. This constituted the High SES group, all the parents of the children of European or North American origin (including 2nd generation Israelis with the same background) and at least one member of each parent pair having completed more than an elementary education. Another fifteen children of the same chronological age were selected from pupils attending special education schools. The latter constituted the Low SES group: all the parents

of these children were born in "Oriental", Arabic-speaking countries, and neither member of the parent pair had completed more than an eighth-grade education. All the children were administered both the verbal scale and digit-symbol subtest of the WISC, and the Raven Progressive Matrices for children. Table 1 summarizes the mean IQ and chronological age data for the two groups.

Table 1

Summary Data for the Two Experimental Groups

Criteria	Retardates (High SES, n = 15)		Special Education (Low SES, n = 15)	
	M	SD	M	SD
Chronological Age (in months)	123.8	22.47	126.13	10.27
IQ (WISC)	67.07	6.55	69.20	5.80
IQ (Raven)	14.90	1.83	16.20	1.65

Note: t tests between groups on all measures were nonsignificant.

Instruments

Three types of experimental learning tasks were selected for use in this study. Variations incorporating several degrees of complexity and difficulty were employed in these tasks, as follows:

1. Paired Associates (PA). Six different variations of this task were administered, varying along the dimensions of length of list, associative strength, and pictorial vs. three dimensional representation. By combining these variations, and

dropping those which on pre-test were either too long or too difficult, the following tasks were included: (a) a short list (8 pairs) of three-eimensional unrelated items (i.e., ball-game; airplane-whistle); b) a short list (8 pairs) of pictorial unrelated items; c) a long list (14 pairs) of three-dimensional unrelated items; d) a long list of (24) three-dimensional related items (i.e., comb-mirror; pencil-eraser); e) a long list (14) of pictorial unrelated items; f) a long list (24) of pictorial related items. Each task was presented to S, following standard procedure for paired associates learning, up to a maximum of eight trials. Scores were the number of correct pairs on each trial.

2. Serial Learning (SL). Four variations of this task were presented, incorporating the dimensions of length and concreteness, i.e., geometric figures varying both in color and shape vs. three-dimensional everyday objects. The variations were: a) a short series (10 items) of three-dimensional objects (ball, key, soap, nail, etc.); b) a long series (14 items) of three-dimensional objects; c) a short series (6 items) of geometric figures; a long series (9 items) of geometric figures. Each variation was presented in the same way. S was first shown all the items in their correct sequence, where each item was covered by a box. On first presentation S was asked to label each item and E accepted S's names, even if they were unconventional. Testing consisted of having S guess what was under each box, going through the whole series for a maximum of six trials. Scores were the number of correct identifications on each trial.

3. Free Recall (FR). This task consisted of 24 three-dimensional familiar objects (ball, air lane, scissors, car, etc.). E first presented each item to S, who was asked to label the object. S's own labels were accepted, or labels were provided where S had none available. E then took all the objects away, and S was asked to recall as many of the items as possible, disregarding order of presentation.

Each item recalled was replaced before the child. When S stopped responding, E waited 30" and then replaced all the objects on the table, asking S to name each one as it was presented. All objects were again removed from the table, and the procedure was repeated for a maximum of six times. Scores were the number of items correctly remembered on each trial.

Ss were tested individually during regular school hours. The experimental tasks were divided over three testing sessions, one week apart, with a maximum of five tasks in each session. Tasks were administered in the same order to all Ss, with the order of tasks in the individual sessions arranged in such a way as to minimize possible interference among items or tasks.

Results

The first hypothesis predicting that low SES retardates will perform better on associative learning tasks but not on more complex problems, was examined by means of t tests computed on mean differences in performance between the two groups on each of the tasks employed. As can be seen in Table 2, no differences were obtained as a function of the variations on the task specified in the introduction. Moreover, no significant differences were found on any of the various types of PA tasks. The low SES Ss significantly outperformed the High SES Ss on all presentations of SL and the single form of Fr (significance levels between p .05- .001).

Table 2

Scores on Learning Tasks for the Two Experimental Groups

Learning task	Retardates (High SES)		Special Education (Low SES)		t	p
	M I	SD	M I	SD		
FR (24 items)	75.47	14.30	90.67	10.94	3.19	.005
SL1 (concrete, 10 items)	35.13	9.15	43.20	9.40	2.32	.025
SL2 (concrete, 14 items)	43.46	16.35	52.87	10.68	1.91	.05
SL3 (abstract, 6 items)	21.47	6.94	25.93	4.46	2.04	.05
SL4 (abstract, 9 items)	23.64	8.01	31.13	11.04	2.64	.01
PA1 (concrete, 8 items, distant assoc.)	53.71	8.39	56.60	7.59	0.98	ns
PA2 (concrete, 14 items, distant assoc.)	74.58	22.74	74.06	23.66	0.06	ns
PA3 (concrete, 24 items, near assoc.)	136.13	7.14	136.33	9.44	0.06	ns
PA4 (abstract, 8 items, distant assoc.)	36.38	20.46	46.66	13.85	1.65	ns
PA5 (abstract, 14 items, distant assoc.)	76.01	21.13	81.13	19.39	0.68	ns
PA6 (abstract, 24 items, near assoc.)	186.69	3.84	187.00	3.25	0.24	ns

The intercorrelations among the performance measures on the learning tasks were computed separately for the two groups and are presented in Tables 3 and 4.

Table 3

Intercorrelation of Learning Task Scores (Special Education, Low SES)

Variable	FR	SL1	SL2	SL3	SL4	PA1	PA2	PA3	PA4	PA5	PA6
FR	1.00	.30	-.03	.22	.34	.14	.15	.23	.19	-.10	.41
SL1		1.00	.72**	-.25	.21	.38	.51*	.37	.14	.33	.30
SL2			1.00	-.23	.31	.43	.53*	.41	.36	.43	.22
SL3				1.00	.02	-.05	-.42	-.36	-.31	-.37	-.12
SL4					1.00	.39	.27	-.08	.41	.20	.38
PA1						1.00	.61**	.16	.60**	.80**	.72
PA2							1.00	.62**	.81**	.54*	.71**
PA3								1.00	.54*	.24	.48*
PA4									1.00	.60**	.73**
PA5										1.00	.69**
PA6											1.00

*p .05
**p .01

Table 4

Intercorrelation of Learning Task Scores (Retardates, High SES)

Variable	FR	SL1	SL2	SL3	SL4	PA1	PA2	PA3	PA4	PA5	PA6
FR	1.00	.53*	.89**	.43*	.38	.15	.22	.40	.62**	.02	.30
SL1		1.00	.77**	.73**	.64**	.04	.28	.48*	.51*	.12	.26
SL2			1.00	.81**	.67**	.33	.48*	.55*	.80**	.15	.42
SL3				1.00	.71**	.15	.54*	.49*	.76**	.37	.44
SL4					1.00	.10	.53*	.38	.42	.09	.62**
PA1						1.00	.47*	.20	.23	.14	.02
PA2							1.00	.66**	.55*	.66**	.30
PA3								1.00	.69**	.40	.49*
PA4									1.00	.40	.49*
PA5										1.00	.17
PA6											1.00

*p .05
**p .01

The intercorrelations are relatively high, and many of them are significant in the high SES group. In the low SES group, however, most of the correlations are low and non-significant. The only exception is in the series of PA tasks where the task intercorrelations for low SES Ss are higher than those on other tasks and than for the comparable correlations in the high SES group, and all but two are significant.

The hypothesized differences between the two SES groups regarding the relationship between measured intelligence and associative learning were examined by the

correlation of performance on each task with Raven and Wechsler scores. The results in Table 5 show no consistent differences between the two groups: for both groups, correlations with Wechsler IQ scores are uniformly low, while with Raven scores, the correlations are higher, and a number do reach significance.

Table 5

Correlations between IQ Measures and Learning Task Scores
For the Two Experimental Groups

Learning Task	Wechsler IQ		Raven IQ	
	Low SES	High SES	Low SES	High SES
FR	-.14	.03	.51*	.48*
SL1	-.30	.29	.25	.56*
SL2	.02	.29	.15	.65**
SL3	.53*	.39	.10	.26
SL4	.29	.19	.47*	.36
PA1	.34	.28	.31	.09
PA2	-.22	.28	.50*	.02
PA3	-.21	-.15	.30	.20
PA4	.11	.20	.54*	.44
PA5	.12	.32	.22	-.24
PA6	.05	.31	.55	.15

*p .05

**p .01

Discussion

A central assumption of this study was that, unlike High SES retardates,

the poor performance of low SES Ss on IQ tests is mainly a reflection of those factors involved in secondary retardation. The hypothesis then follows that the low SES Ss would out perform the high SES Ss on Level I, But not Level II, tasks. The significant differences found between the two SES groups on SL and FR tasks (and the finding of no difference on PA) seem to confirm the hypothesis. This appears in keeping with Jensen's contention that SL and FR are typical of associative learning, whereas PA is more closely related to Level II (Jensen and Rohwer, 1965).

It was also suggested in the present study that Jensen's dichotomous model of two distinct types of learning might better be viewed as a continuum varying along several dimensions of complexity. This possibility was examined by varying the tasks in terms of length (number of items), degree of concreteness, and the associative distance between elements. These variations, however, had no effect on the performance of either group of retardates. Other studies (Semler and Iscoe, 1963; Rohwer, 1971), employing somewhat different sets of variations, were more successful. In the latter studies, however, only Ss within the normal range of intelligence were employed. The task variations utilized in the present study are currently being tested with a normal group of children from different SES groups so as to investigate whether range of intelligence is a factor in this issue.

An additional hypothesis that there will be a stronger relationship between Level I task and IQ for high SES Ss and no between SES group differences in the correlation between Level II and IQ - was not confirmed. There were no significant relationships between the learning tasks and Wechsler scores for either group. This perhaps may be due to the poor standardization of the Hebrew version of the test used in Israel. The relationship between Level I performance and Raven Matrices scores was considerably stronger, but there were no differences between the groups.

However, while there was no significant relationship between PA and Raven scores for High SES Ss, a relatively strong relationship between the latter scores unexpectedly was found for Low SES Ss.

This difference between the SES groups, while in itself not particularly significant, perhaps becomes more meaningful when viewed in light of the intercorrelations among the various learning tasks for both groups (Tables 3 and 4). Almost twice the number of significant correlations are obtained for High SES Ss (27 out of 35) than for Low SES Ss (16 out of 55). If, however, the intercorrelations for Level L and Level II tasks as defined in this study are examined separately, an interesting pattern becomes evident. For High SES Ss, the relationship among Level I items is very prominent (9 out of 10 correlations are significant). The relationship among Level II items is also considerable, although not as clearly so as with Level I (7 out of 15 significant). For Low SES Ss, on the other hand, relationships can be found almost solely among Level II tasks, exceeding in number those found for High SES Ss. There is practically no relationship among scores on Level I tasks for Low SES Ss.

The lack of relationship among Level I task scores in the Low SES group corresponds to Stevenson, et al's (1968) findings with normal Ss. They concluded that there is little justification for conceiving of Level I as a unitary type of learning, and that it should rather be viewed as a collection of specific learning abilities. Our data suggests that Stevenson et al's argument against Jensen's distinction between two types of learning is relevant for Ss in the normal range of intelligence and for Low SES Ss in the secondary retardation category. With such Ss, a unitary learning ability can perhaps be demonstrated only on Level II tasks, whereas the abilities represented by Level I tasks appear to be highly specific.

However, there is still some justification for Jensen's thesis that in

comparing the performance of two SES groups matched on IQ, there will be no difference in general learning ability on Level II tasks, whereas in the specific tasks that constitute Level I, the Low SES Ss on average will perform as good or better than High SES Ss. This thesis, however, is perhaps best seen as a group phenomenon. On an individual level, predictions about performance on Level I tasks would be difficult, owing to their high degree of specificity.

A great degree of generality among Level I tasks does seem to be characteristic of the performance of the primary (high SES) retardates. This generality, however, tends to extend to all types of learning - Level II as well as Level I. Consequently, in the case of primary retardates, it seems more appropriate to speak of a general impairment of learning ability.

The data suggest a theoretical distinction between primary and secondary retardation not unlike that made by Orn and Das (1972). Impairment of learning ability in primary retardates is consistently reflected across all types of learning tasks. On the other hand, the learning difficulties of secondary retardates may be confined to that general learning ability defined as Level II, with no performance impairment on the more specific Level I tasks.

While obviously in need of further investigation, this suggestion might lead to the development of a simple series of tasks which sample both types of learning. The diagnostic distinction for individuals between primary and secondary retardation would be along the following lines: an individual who consistently scores below some established norms on both types of learning tasks would be classified in the category of primary retardation. Another individual whose performance is below the norms only on Level II tasks (which include standard IQ measures) while scoring above the norm on Level I tasks or who exhibits considerable inconsistency among these tasks, would be considered within the category of secondary retardation and hence subject to different educational planning and intervention.

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Footnotes

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